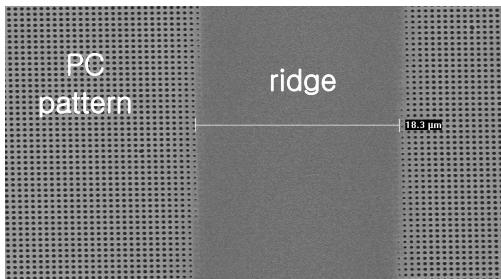


## Combination of Holographic and Photo-mask Lithography for fabrication of photonic crystal patterns

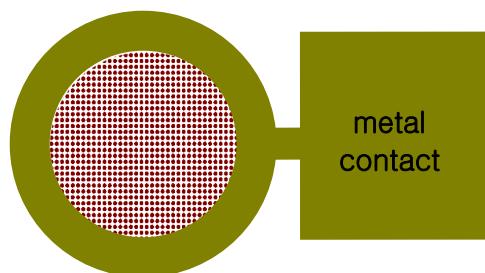
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We report that combination of holographic and conventional photo-mask lithography can produce photonic crystal patterns within a specific area in a very short time. At first, periodic photonic crystal (PC) pattern is transferred to photo-resist by laser hologram, and then non-periodic envelope pattern is transferred by photo-mask exposure. Combination of these two lithography methods can transfer target pattern onto 2 inch wafer in several minutes at most. For example, ridge pattern surrounded by PC pattern for DFB laser can be produced as in Fig. 1, and PC pattern surrounded by circular envelope for PC LED can be made as in Fig. 2.

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**Fig.1** SEM image of PC pattern + ridge pattern for DFB lasers.



**Fig.2** PC pattern + circular envelope pattern for metal contact of LED